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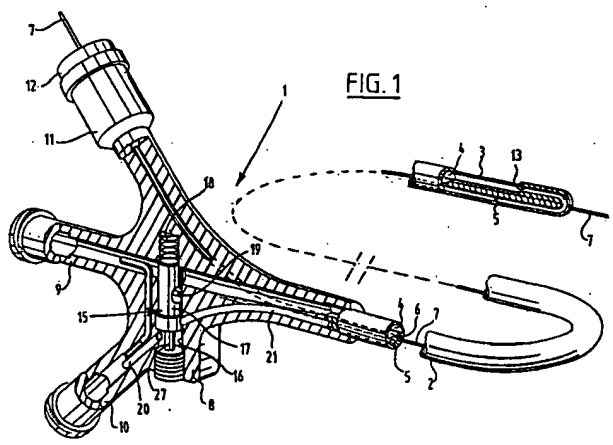
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(54) **Suction catheter with haemostatic device**

(57) This invention relates to a suction catheter comprising a tube-like basic body with a proximal and a distal end, inside of which at least a pressure lumen and a discharge lumen extend, wherein at the distal end an opening connected with the discharge lumen and a jet nozzle connected with the pressure lumen and opening out into the discharge lumen have been arranged and

wherein the catheter comprises valve means which are moveable by means of operating means between a closed position in which the pressure lumen and the discharge lumen are closed and an open position wherein both lumens are open.



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Description

The invention relates to a suction catheter comprising a tube-like basic body with a proximal and a distal end, inside of which at least a pressure lumen and a discharge lumen extend. At the distal end an opening has been arranged in the basic body which is connected to the discharge lumen, and a jet nozzle which is connected to the pressure lumen and discharges into the discharge lumen.

With such a known suction catheter the jet nozzle may produce a liquid jet along the opening resulting in ejector action. Due to the suction generated at the site of the opening, for instance thrombi may be discharged.

In order to prevent blood from flowing out via the discharge lumen and the pressure lumen when the catheter is positioned inside the body of a patient but is not in use, it is known to shut off the proximal ends of the discharge lumen and the pressure lumen with valves.

When using such a known suction catheter there is a danger that liquid under pressure is introduced into the pressure line whilst the haemostatic valve of the discharge lumen is still closed. In that case the liquid under pressure supplied will enter, via the opening at the distal end, the bloodstream of the patient, which is undesirable.

The object of the invention is to provide a suction catheter of the type as described in the preamble which does not have this drawback.

This aim is achieved with the suction catheter according to the invention as characterised in claim 1. As the valve means open and close the pressure lumen and the suction lumen simultaneously, the discharge lumen is always open when liquid under pressure is introduced into the pressure line.

A very advantageous further development of the invention has been characterised in claim 2. In this case the valve means shut off the lumens when the catheter is not in use and the valve means are opened automatically when liquid under pressure is supplied.

Preferably the measure as set out in claim 3 is employed. Additionally the activation means act against the force exerted by the resilient means in order to move the valve means into the open position.

A very suitable embodiment has been characterised in claim 4. As soon as liquid under pressure is introduced into the pressure lumen, pressure is applied to this slide due to the pressure of this liquid and is pushed, against the force exerted by the resilient means, into the open position.

The valve means and the operating means can be combined in a favourable manner by employing the measure as set out in claim 5.

A suitable embodiment has additionally been characterised in claim 6. In the open position the discharge lumen forms a continuous channel so that no flow resistance is created, which is very important in order for the catheter to function properly.

With the measure as set out in claim 7 simultane-

ous opening and closing of the discharge lumen and the pressure lumen is achieved in an advantageous manner.

By employing the measure as set out in claim 8 it is achieved in a simple manner that on the one hand the pressure lumen is closed when the valve means are closed whilst, on the other hand, the liquid under pressure supplied via the relatively proximal section of the pressure lumen can act on the slide in the required manner in order to open it.

A suitable embodiment has been characterised in claim 9.

The invention will be explained in greater detail with reference to the attached drawings.

Figure 1 illustrates in a partly broken away perspective view a preferred embodiment of the catheter according to the invention whilst the valve means are closed.

Figure 2 shows a view corresponding to figure 1 with the valve means open.

The catheter 1 illustrated in figure 1 comprises a tube-like basic body 2. Three lumens have been formed inside the basic body 2; a pressure lumen 5, a discharge lumen 4 and a guide wire lumen 6.

At the distal end of the basic body 2 an opening 3 has been formed which is connected with the discharge lumen 4. At the distal end of the catheter the pressure lumen 5 ends in a jet nozzle 13. Liquid under pressure supplied via the pressure lumen 5 leaves the jet nozzle 13 in the form of a powerful jet, which is directed inwards along the opening 3 in the discharge lumen 4. Due to this jet there will be an ejector action which generates suction at the opening 3, which can be used to remove for instance blood clots via the discharge lumen 4.

When positioning the catheter 1, the guide wire lumen 6 is used for the passage of the guide wire 7.

At the proximal end of the catheter 1 a connecting member 8 has been arranged, inside of which the connections with the lumens have been received. For the sake of clarity this connecting member 8 has been illustrated in figure 1 whilst rotated, in relation to the basic body 2, a quarter turn to the left. Via a channel 23 in the connecting member 8, the discharge lumen 4 is connected with the discharge connection 9. The pressure lumen 5 is connected with a pressure connection 10 via channel sections 20 and 21. The guide wire channel 7 is connected with the guide wire connection 11. This guide wire connection 11 has been provided with an anti-haemostatic device 12 known as such, which prevents blood from flowing out via the guide wire channel whilst using the catheter 1.

The discharge connection 9 and the pressure connection 10 have both been provided with Luer-lock connections.

Inside the connecting member 8 valve means 15 have been received which can open and close the pressure lumen and the discharge lumen simultaneously.

With the preferred example of an embodiment illus-

trated, the valve means 15 comprise a slide 17, movable to and fro, received inside a channel 16 formed inside the connecting member. The channel 16 has been closed off with a plug 22. As can be seen in the figures, the slide 17 is, at its end turned away from the screw plug 22, acted upon by a helical spring 18. The latter pushes the slide 17 into the closed position illustrated in figure 1, in which both the discharge lumen and the pressure lumen have been blocked. The slide has been provided with a distance pin 27 with which the slide 17 is positioned against the screw plug 22 when closed.

As can be seen in figure 1, in closed position the slide 17 leaves the relatively proximal section 20 of the pressure lumen free and closes the relatively distal section 21 of the pressure lumen off. In this state consequently no blood can leak away via the discharge lumen 4 or the pressure lumen 5 from the connections 9, 10 respectively.

As the relatively proximal section 20 of the pressure lumen is connected to that side of the slide 17 opposite to the side of the slide which is acted upon by the spring 18, the slide 17 will be pushed upwards against the force exerted by the spring 18, when via the pressure connection 10 liquid under pressure is supplied.

In the open position illustrated in figure 2, a transverse channel 19 in the slide 17 has been moved in line with the channel 23 inside the connecting member 8, forming the continuation of the discharge lumen 4. The cross-section of the transverse channel 19 is equal to the cross-section of the channel 23, so that in the open position there will be no resistance to flow. The material sucked up through the opening 3 can consequently be removed freely via the discharge lumen 4 and the channel section 23 from the discharge connection 9.

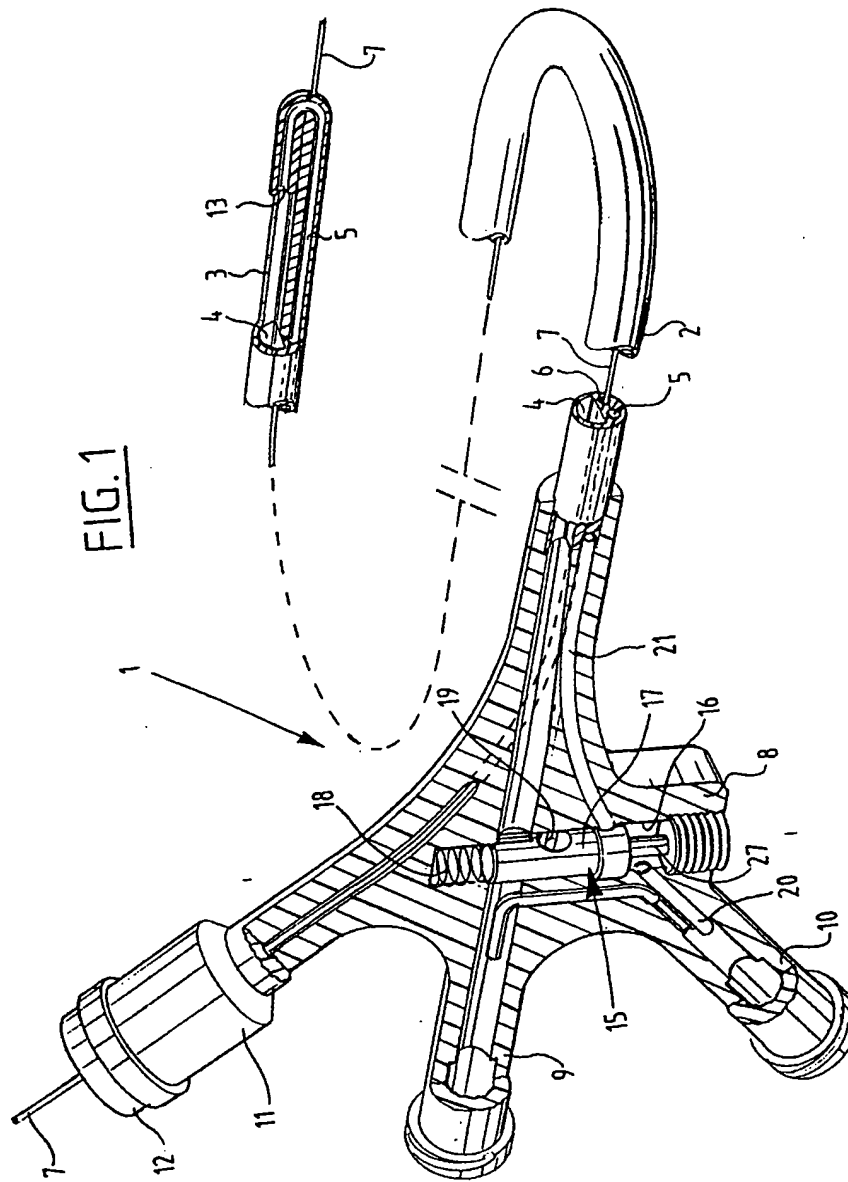
At the same time the discharge lumen 4 is opened the slide 17 is moved away from the entrance of the relatively distal section 21 of the pressure lumen, so that the liquid under pressure supplied via the connection 10 can flow freely via the relatively proximal section 20 to the relatively distal section 21 and then via the pressure lumen 5 to the jet nozzle 13.

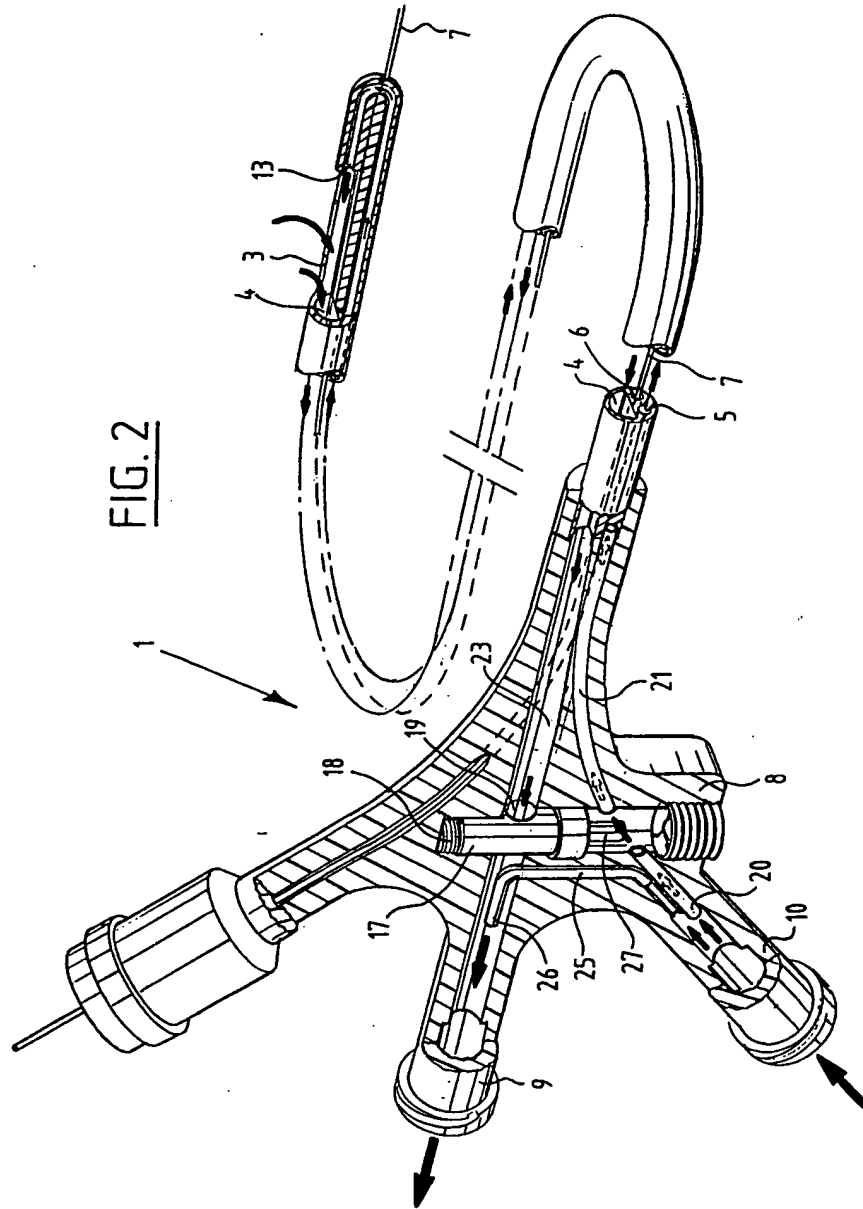
To assist the flow in the discharge lumen an auxiliary pressure channel 25 has been formed in the connecting member 8 of which the outlet 26 is directed towards the connecting member 9. Via this auxiliary pressure channel 25 part of the liquid under pressure supplied through the pressure connection 10 flows away in the direction indicated by the arrows, as a result of which a liquid jet is formed at the outlet 26 of the auxiliary pressure channel 25, reinforcing the flow in the discharge lumen 4 as referred to above.

As soon as the supply of liquid under pressure via the pressure connection 10 is closed off, the slide 17 will be pushed into the closed position illustrated in figure 1 due to the action of the spring 18, in which at the same time the pressure lumen and the discharge lumen are closed off, so that no blood can leak away via the lumens in an undesirable manner.

Claims

1. Suction catheter comprising a tube-like basic body with a proximal and a distal end, inside of which at least a pressure lumen and a discharge lumen extend, wherein at the distal end an opening connected with the discharge lumen and a jet nozzle connected with the pressure lumen and opening out into the discharge lumen have been arranged and wherein the catheter comprises valve means which can be moved by means of operating means between a closed position in which the pressure lumen and the discharge lumen are closed and an open position wherein both lumens are open.
2. Suction catheter as claimed in claim 1, wherein the operating means comprise pressure detection means connected with the pressure lumen and associated with it activation means which open the valve means when pressure is generated inside the pressure lumen.
3. Suction catheter as claimed in claim 2, wherein the valve means are forced into the closed position by resilient means.
4. Suction catheter as claimed in claim 3, wherein the operating means comprise a slide received in a movable manner inside a channel which, on one side, is acted upon by the resilient means and is connected with the pressure means at the opposite side.
5. Suction catheter as claimed in claim 4, wherein the discharge lumen intersects the channel and the slide in closed position blocks the discharge lumen and leaves it free in open position.
6. Suction catheter as claimed in claim 5, wherein the slide comprises a transverse channel which has substantially the same cross-section as the discharge lumen, which in open position is situated in line with the discharge lumen.
7. Suction catheter as claimed in one of the claims 4 - 6, wherein the pressure lumen intersects the channel and the slide blocks the pressure lumen in the closed position and leaves it free in the open position.
8. Suction catheter as claimed in claim 7, wherein, in the closed position, the slide leaves the relatively proximal section of the pressure lumen free and closes off the relatively distal section.
9. Suction catheter as claimed in one of the previous claims, wherein the valve means have been received in a connecting member at the proximal end of the catheter.





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EUROPEAN SEARCH REPORT

Application Number
EP 97 20 1317

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
Y	EP 0 693 295 A (CORDIS) 24 January 1996 * abstract; figure 1 *	1,9	A61M1/00
Y	EP 0 576 380 A (AGUETTANT) 29 December 1993 * column 5, line 2 - line 59; figures *	1,9	
Y	WO 93 05826 A (HEIDMÜLLER) 1 April 1993 * page 8, paragraph 2 - page 9, paragraph 4; figures *	1,9	
A	GB 2 117 497 A (SMITHS INDUSTRIES) 12 October 1983 * page 2, line 89 - page 3, line 63; figures *	1-5,7,9	
A	EP 0 654 275 A (DELMIA) 24 May 1995 * page 4, line 4 - page 5, line 29; figures 2,3 *	1-4,9	
The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (Int.Cl.6)
			A61M
Place of search THE HAGUE		Date of completion of the search 6 August 1997	Examiner Kousouretas, I
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